PIONEER: An open innovation platform for optimising for optimising production systems by combining product development, virtual engineering workflows and production data

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Abstract

PIONEER aims the development of an open innovation platform and interoperable digital pipeline for addressing a design-by-simulation optimisation framework. It integrates inline feedforward control strategies for enhancing the efficiency of the industrial systems in high-mix/low-volume production schemes. This approach connects materials modelling and materials characterisation, simulation-based digital twins and data-driven models, updated through distributed production data from embedded IoT edge devices and product quality.

PIONEER establishes a unified methodology demonstrated through two case studies. The first involves multidisciplinary optimisation for ensuring certified path planning strategies for the manufacturing of topology optimised structural elements through Wire-Arc Additive Manufacturing (WAAM) in the construction sector –i.e., low-volume production schemes–. The second focuses on optimising design and manufacturing strategies for the manufacturing of Carbon Fibre Sheet Moulding Compound (CF-SMC) components in automotive –i.e., high-mix production schemes–.